SAPIA Refineries

Process Safety Leading and Lagging Key Performance Indicators (KPIs)

Best Practice Sharing 2016

sapia | South African Petroleum Industry Association

Process Safety KPIs: SAPREF

Leading	Lagging
RV (relief valve)tests overdue	Fires
No. Of RV tests deferred	LOPCs – Loss of primary containment (>100kg)
Alarm rate per panel/hour	LOPCs (10-100kg)
No. Of disabled alarms	API Tier 1 LOPCs
No. Of IPF (instrumented protective function) tests overdue	API Tier 2 LOPCs
No. Of IPF tests deferred	
Design Operating window violations (%time)	
Integrity operating window violations (%time)	
No. Of open PCR (Plant change requests)s	
No. Of temporary PCRs overdue	
No. Of SCE (safety critical equipment) PMs overdue	
No. Of SCE inspections overdue	
No. Of approved extensions to SCE inspection due date	

Process Safety KPIs: ENREF

Leading	Lagging
1. % Safety Critical Corrective Maintenance (SCCM) Overdue	1. Minor fire
2. % Safety Critical Preventive Maintenance (SCPM) Overdue	2. Major Fire
3. Overdue Temporary MOC	3. Minor LOPC
4. Bypassed Safety Critical Equipment (SCE)	4. Major LOPC
5. Instrumented Protective Function (IPF) Failed to Danger	
6. Alarm Rate per Hour per Console	
7. Fixed Gas Detectors Failed to Danger	
8. Relief Valve Failed on Demand	

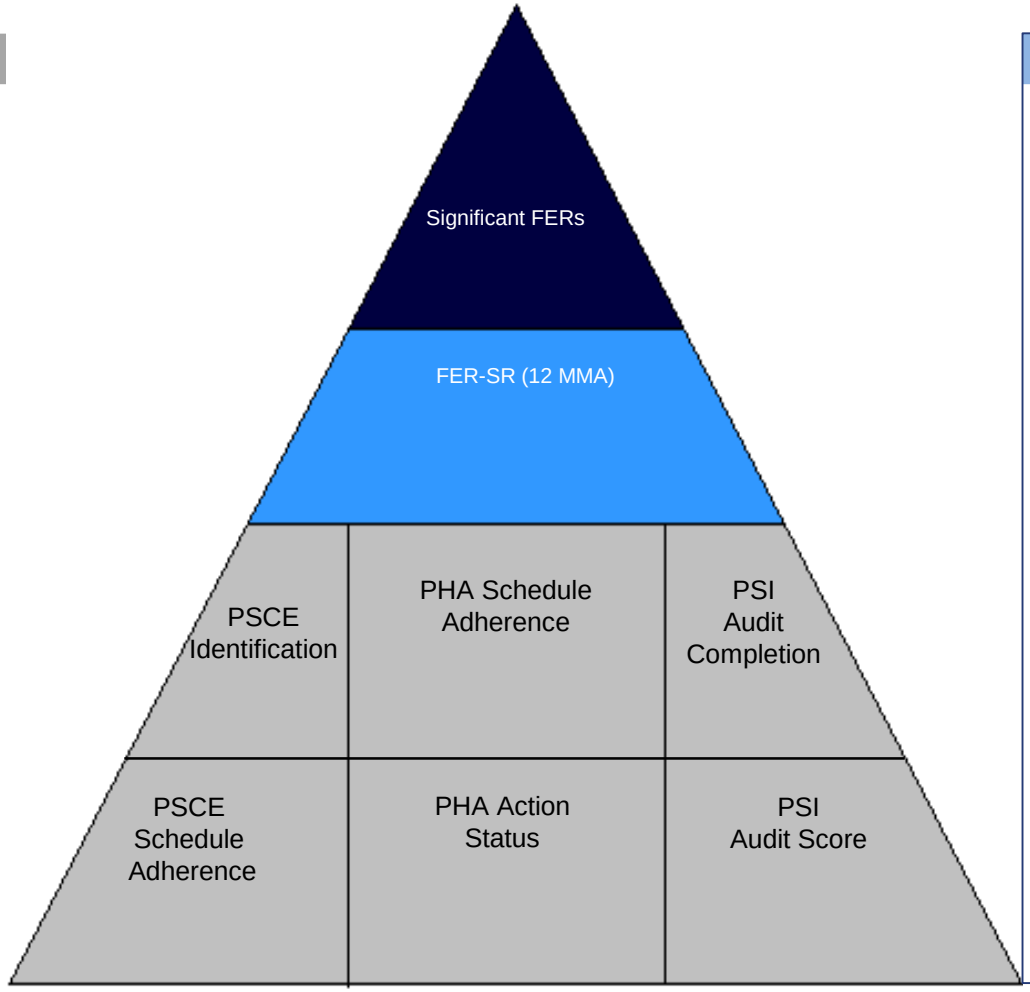
Process Safety KPIs: CHEVREF

Leading	Lagging
Tier 3 □*Integrity Operating Window Exceedances* □Safety Instrumented Systems Activated □Process PRDs Activated □Days Exceeding Alarm Limits (OERI)	**Tier 1** □Loss of Containment (LOC) Events □LOC Free Days □Corporate Recordable Fires
Tier 4 □Elevated Risks Identified & Mitigated □Overdue PHA Recommendations (OERI) □Overdue Temporary MOCs (OERI) □Overdue Permanent MOCs (OERI) □Safety Instrumented Functions Disabled (OERI) □Overdue Overspeed Trip Tests (OERI) □Overdue PRD Tests (OERI) □Overdue Fixed Equipment Inspections (OERI) □Level 2 & 3 Incidents Citing Operating & Maintenance Procedures as a Root Cause □Overdue Safety Instrumented Systems Functional Tests (OERI) □Overdue Integrity threat recommendations (OERI)	**Tier 2** □Loss of Containment Events □LOC Free Days

Process Safety KPIs: SASOL

Leading	Lagging
PSCE (Process Safety critical equipment) • Maintenance, inspection, etc. • Identification.	Number of significant incidents, as classified by the Excel tool (Used in Sasol RSA)
PHA (Process Hazard Analysis) • Schedule adherence. • Completion of high risks.	FER-SR (Fire, Explosion, Release Severity Rate
PSI (Process Safety Information) • Adherence to audit schedule. • Audit score	

SSO: Leading and lagging



PSCE identification = (Q_1/Q_2) x 100

- Q_1. The number of plants where PSCE has been identified in the reporting period to date.
- Q_2. The total number of plants where PSCE was planned to be identified for the reporting period to date.

PSCE schedule adherence = (Q3/Q4) x 100

- Q_3. Number of PSCE inspected, tested and maintained according to the schedule for the reporting period to date.
- Q_4. The number PSCE due for testing, inspection and maintenance for the reporting period to date.

PHA schedule adherence = (Q1/Q2) x 100

- Q_1. How many PHA studies have been done in the period to date
- Q_2. Total number of PHA studies scheduled in the period to date.

PHA action status = (Q1/Q2) x 100

- Q_1. Number of priority PHA actions completed within the target date for the period to date.
- Q_2. Total number of priority PHA actions due in the period to date.

PSI status audit completion = (Q1/Q2) x 100

- Q_1. The number of plants where PSI audits have been completed in the reporting period to date.
- Q_2. The total number of plants where PSI audits were scheduled for the period to date.

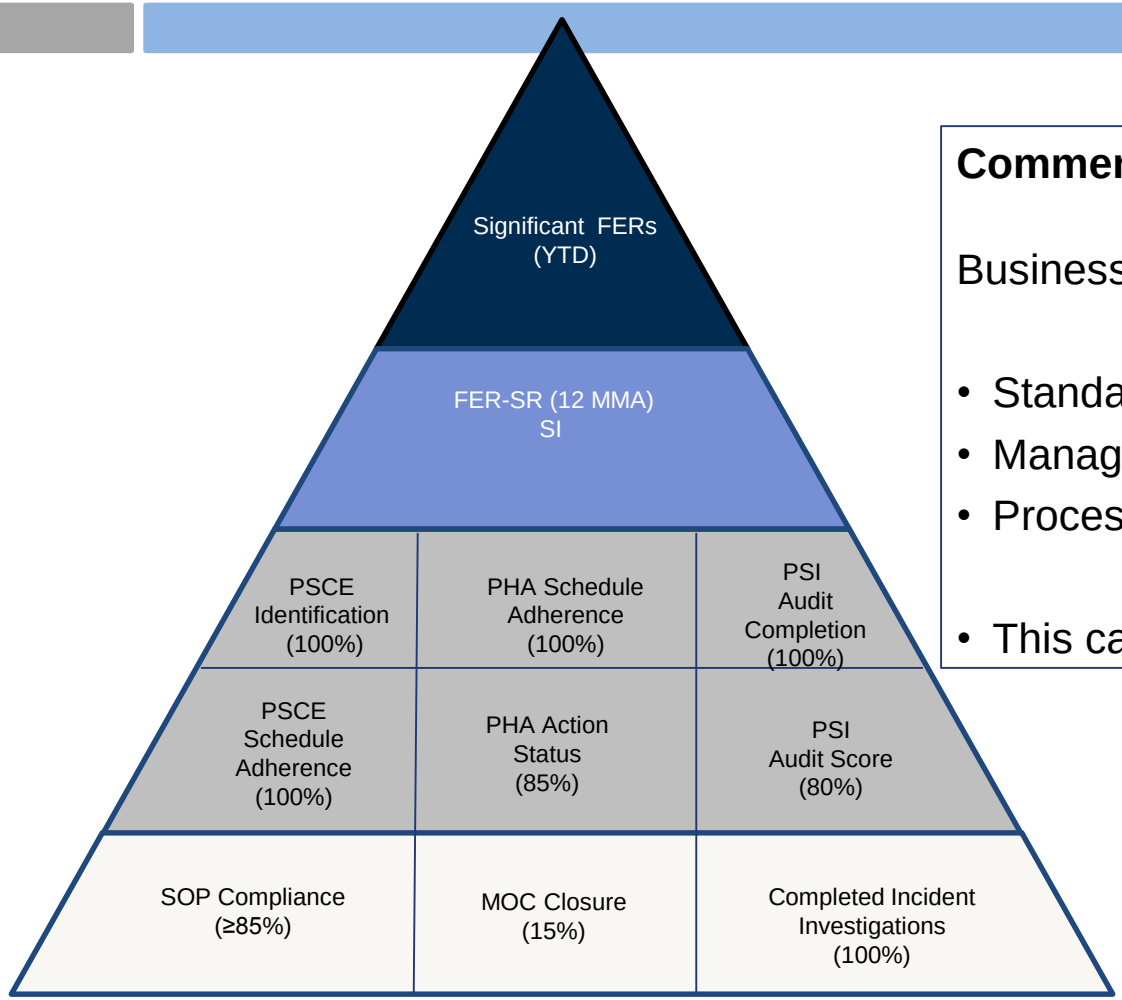
PSI status audit score = Q_1

- Q_1. Average (percentage) PSI audit score for all plants already audited in the operating entity for the reporting period to date.

Note. Q_1,Q_2,Q_3 and Q_4 are variables

Comment: Tier 1-3 indicators are tracked at group level

Refinery: KPI performance



Comments

Business unit level track more indicators:

- Standard operating procedure compliance.
- Management of Change closure rate.
- Process safety incident investigation.

- This called TIER 4 leading indicators.

Process Safety KPIs: NATREF

Leading	Lagging
Process Safety Information	FER-SI
Process Safety Critical Equipment identification	FER-SR
Process Safety Critical Equipment inspection adherence to schedule	
PHA schedule adherence	
PHA action closure	
Trip overrides	
MoC closure	

END